

U.S. Army. Forces in the Pacific.  
Office of the Chief Surgeon.  
Commission on Schistosomiasis

GENERAL HEADQUARTERS  
UNITED STATES ARMY FORCES, PACIFIC  
OFFICE OF THE CHIEF SURGEON

COMMISSION ON SCHISTOSOMIASIS

APO 500  
Advance Echelon  
12 December 1945

SUBJECT: Report of Survey of endemic areas of schistosomiasis  
in Japan

TO : Chief Surgeon, GHQ AFPAC, APO 500.  
Surgeon, Sixth Army, APO 442.  
Surgeon, Eighth Army, APO 343.

1. Pursuant to Order 973 AGPD-A 29 Oct 45, GHQ USAFPAC, Advance Echelon, personnel of the Commission on Schistosomiasis carried out surveys of the endemic areas of schistosomiasis in the Eighth and Sixth Army Commands between 29 October and 3 December, 1945, with the view of obtaining information concerning the present extent of these areas and the securing of other data which might be pertinent to the prevention of the disease in military personnel.

2. Personnel of Commission. The following personnel was concerned in the conduct of the surveys in the Eighth Army Command:

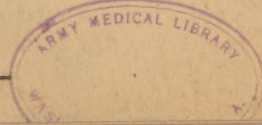
Col Willard H. Wright, PHS 5090, USPHS, Field Director.  
Dr. Donald B. McMullen, Consultant to the Surgeon  
General.

Maj Harry J. Bennett, 0232730, SnC.  
Maj Fred B. Bang, 0403295, MC.  
Tec 3 Preston M. Bauman, 13019292, MC  
Tec 4 James W. Ingalls, 31253392, MC.  
Tec 4 George A. Faris, 19137029, MC.  
Tec 5 William M. Feigin, 12127102, MC.

Major Bang and Tec 4 Faris departed Stateside on 25 November, and did not take part in the surveys in the Sixth Army Command. Tec 5 Feigin departed Stateside on 1 December.

3. Contact with Japanese Government officials. Contacts were made with Japanese health officials through the office of Colonel C. F. Sams, Chief, Public Health and Welfare Section, SCAP. Available information concerning the present status of the endemic areas of schistosomiasis in Japan was obtained at several conferences with Prof. K. Nobechi, Chief, Division of Preventive Medicine, Institute of Public Health, Dr. N. Tate-

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bayashi, Chief, Section of Communicable Diseases, Ministry of Welfare and Social Affairs; Dr. Nobutaro Ishii, Chief, Research Laboratory of Parasitology, Government Institute for Infectious Diseases, and Prof. K. Nagano, Chief, Parasitology Department, Kitasato Institute for Infectious Diseases. In general it may be said that little information of a specific nature was obtained from these officials in the way of morbidity rates, incidence surveys, etc. Nearly all specific data furnished the Commission <sup>were</sup> published in 1932, and there appeared to be little of more recent date available.

Some of the Prefectural and local health authorities were able to furnish valuable data and where information of this sort was secured, it has been incorporated in this report.

4. Distribution of Schistosoma japonicum in Japan. There are five established endemic areas of schistosomiasis in Japan, viz: The Tone River area in Chiba and Ibaraki Prefectures, northeast of Tokyo, the Kofu area, centered around the city of that name in Yamanashi Prefecture, approximately 80 airline miles due west of Tokyo; the Numazu area in Shizuoka Prefecture approximately 80 miles southwest of Tokyo on Suruga Bay; the Fukuyama area, immediately to the north of the city of Fukuyama, and covering parts of Hiroshima and Okayama Prefectures; and the Kurume area, surrounding the City of Kurume, and covering parts of Saga and Fukuoka Prefectures. The first two of these areas are in the Eighth Army Command, and the last three in the Sixth Army Command.

In addition to the established endemic areas, schistosomiasis has been reported in other parts of Japan. In TB Med 160 (May 1945) egg carriers are listed in Tochigi, Aomori, and Fukui Prefectures, in addition to those in prefectures known to harbor the disease. The Commission has endeavored to secure definite information concerning the occurrence of autochthonous cases of the disease in the three above-mentioned prefectures. Japanese health authorities in Tokyo are of the opinion that the finding of egg carriers in Tochigi and Aomori Prefectures is probably indicative of imported cases and that the disease is not endemic in these prefectures. The same opinion was given in connection with Fukui Prefecture. However, attention was called to the data in TB Med 160 which lists 168 Schistosoma egg carriers in villages in Fukui Prefecture among 2,000 individuals examined in 1937-1938. A further search of records in the Ministry of Welfare and Social Affairs disclosed reports for 1940 of 4 carriers in 110 examinations in Fukui City and 3 carriers in 70 examinations in villages. In view of the conflicting opinion regarding this area, at the request of the Commission the Ministry telegraphed the Health Officer of Fukui Prefecture for specific information concerning the status of the disease in that Prefecture. At the time this report







was compiled this information had not been received.

The disease also existed formerly in certain parts of Tokyo Prefecture, but Japanese health officials stated emphatically that these endemic foci had been eradicated.

5. Method of conducting surveys. On entering an endemic area, as much information as possible concerning the status of the disease was obtained from prefectural and local health authorities and from practicing physicians. Based on this information, certain schools in various parts of the area were selected and a representative number of stool samples obtained from children in the higher age groups for microscopic examination for schistosome ova. Surveys were then conducted in various parts of the area for Katayama nosophora, the snail intermediate host of Schistosoma japonicum; when the snails were found, sufficient numbers were collected for transport to the laboratory for examination for incidence of infection. In addition, in certain areas, the stool examinations were supplemented by physical examination of the selected school children for hepatomegaly and splenomegaly, physical conditions which are frequently associated with moderate to severe schistosome infections.

6. Training of Malaria Survey Detachment personnel in conduct of schistosomiasis surveys. The period of six weeks allotted by the Office of the Surgeon General for surveys by the Commission did not provide sufficient time for the conduct of exhaustive surveys in the endemic areas in question, although it was sufficient to provide certain basic information concerning the present status of the disease in these areas and to evaluate possible hazards to military personnel. It was believed that some provision should be made for further and more exhaustive surveys in these areas and with that in view a memorandum was submitted to the Office of the Chief Surgeon, AFPAC, Advance Echelon, on 29 October, 1945, suggesting that certain personnel from Malaria Survey Detachments be assigned on temporary duty with the Commission for the purpose of receiving training in survey work. Pursuant to that memorandum, the Surgeon, Eighth Army, assigned for this training the following named officers and enlisted men from the units designated:

442d Malaria Survey Detachment

Capt Louis Olivier, SnC  
S/Sgt Kenneth H. Miller  
Tec 5 Stephen A. Dutton

34th Malaria Survey Detachment

Capt Edwin R. Helwig, SnC  
Tec 5 Donald Ayres  
Tec 5 --- Bartholomew







443d Malaria Survey Detachment

1st Lt M. Zarrow  
Tec 4 Milton G. Grivas  
Tec 5 Owen P. Killeen

444th Malaria Survey Detachment

1st Lt John E. Chattin  
S/Sgt James A. Pearson  
Pfc John A. Fox

219th Malaria Survey Detachment

Capt Leonard R. Davis  
Tec 4 William J. Gannon  
Tec 4 R. W. Alruty  
Tec 5 A. A. Manning

Between 6 and 10 November, one officer and two enlisted men from the above-mentioned detachments spent one day in the laboratory of the Commission at the 251st Station Hospital receiving instruction in the technique of stool examination and in the identification of schistosome and other parasite ova. On 11 November, the entire party departed for Kofu, Yam-anashi Prefecture, for instruction in field work under the tut-  
elate of Major Fred B. Bang, Captain Louis Olivier, and Prof. K. Nagano, Chief, Parasitology Department, Kitasato Institute for Infectious Diseases, who had worked in the area and who kindly volunteered to accompany the group. Previous arrange-  
ments had been made with the Commanding Officer, 303d Infantry, 97th Infantry Division, for quarters and mess for the group. The training included the interviewing of local health offic-  
ials, the collection and examination of stool samples from children in schools in the endemic area, demonstration of phys-  
ical examinations for hepatomegaly and splenomegaly, and the collection of snails for schistosome infection. The members of the party returned to their various stations on 17 November. It is believed that the training which these individuals re-  
ceived will enable them to carry on efficiently survey work in connection with this disease.

For the reason that Malaria Survey Detachments under Sixth Army Command were to be deactivated at an early date, no training program was undertaken with such personnel.

7. Surveys in the Tone River area, Shiba and Ibaraki Prefectures. This area was surveyed on 29 and 30 October, 7, 8, and 9 November, and 3 December, in company with Dr. N. Ishii and Miss Yasuko Mitoma of the Government Institute for Infec-  
tious Diseases.

a. General description and extent of infection. The infection in the Tone River area occurs in three foci, appar-







ently quite far removed from one another, without, insofar as we were able to learn, any connecting links (Map I). One area is centered around the City of Sawara and includes parts of Toyoura, Tsunomiya, Toyoshima, and Higashiōta Townships, Katori County, and the Kita-Sawara area in Ibaraki Prefecture across the Tone River from Sawara. This area measures approximately 16 miles from east to west and is about 5 miles in extent from north to south. Another area surrounds the City of Sakura and measures approximately 2 X 4 miles. A third area, concerning which there is some doubt at present, lies in Ibaraki Prefecture, extending east and west along the Tone River from Fukawa and northward as far as Maeshinden. Because of lack of time, opportunity was not had to survey this area.

Since small scale maps (1:50,000) of these areas were not obtainable at the time of these investigations and are still not obtainable, considerable difficulty has been met in securing information from health authorities concerning definite boundaries of these areas. However, it is quite possible that these endemic zones are more extensive than known at present and that other endemic foci occur elsewhere in the Tone River Valley. At present, the whole valley of that river in Chiba and Ibaraki Prefectures must be regarded as a suspected endemic area, although the infection rate in known endemic centers is very low.

Certain data were obtained from Dr. S. Murata, Chief of the Public Health Section Chiba Prefecture Office, concerning schistosomiasis surveys in the Tone River and other areas. The following table gives information concerning surveys made of the entire population in the places named, the stool examinations being conducted with the antiformin-ether technique, which is much more efficient than is the technique using a single fecal smear.

Table 1. Results of schistosomiasis surveys carried out by Health Department Chiba Prefecture. Entire population of areas surveyed; total number of persons unknown.

County	Town or village	Year	No persons Infested	% Persons Infested
Imba	Nego, Chiyoda, Wada, Sakura, Asahi, Uchisato	1925	167	0.91
←	Higashikat-sushika, Fuse, Tanaka, Abiko			
Imba	Shisui, Uchisato, Rokugo	1928	31	0.36







County	Town or Village	Year	No Persons Infected	% Persons Infected
Imba	Usui, Aso, Shinu, Kosu, Haku, Aziki	1929	1	0.01
Katori	Niljima, Sawara, Tsumiya	1934	31	0.35
Katori	Higashiodo, Sawara, Tsumiya, Okura, Toyoura	1935	21	0.26

In addition to these surveys, a total of 2,678 persons was examined in Toyosato village and 1,536 persons examined in Tak-aoka village, Katori County, in November and December, 1940, without any being positive for schistosomiasis.

In Higashikatsushika County, 2,751 persons were examined in the village of Ohashi in January, 1941, without any positives being found. Apparently no surveys have been made since that time.

b. Examination of school children for schistosomiasis. Three schools were surveyed in Chiba Prefecture, two of them being in the Sawara area and one in the Sakura area. One school in Ibaraki Prefecture was surveyed.

All stool examinations conducted by the Commission were carried out with the use of the plain sedimentation technique. This technique had previously been found to be the most efficient one for practical use in the field through research carried out by members of the Commission on Leyte and Borneo. The technique consists in taking five grams of feces, stirring the sample in water, straining the material through four layers of surgical gauze into a 250 cc conical urinalysis flask, allowing the material to sediment and pouring off the supernatant fluid at least three times. One drop of the final sediment is placed on a slide and examined under the microscope. In the examination of school children in Japan, the Commission has followed the practice of examining two 22 x 22 mm cover glass preparations or one 22 x 40 mm cover glass preparation from each sample. Data are recorded for all helminth parasites but no examination was made for protozoan parasites. It should be noted that the findings of helminth ova other than those of S. japonicum were made incidently; when the latter ova were found on a slide, the slide was discarded and no further search made. It is probable under these circumstances that some cases involving infection with other helminths were missed and that the incidence figures for these helminths are actually lower than the true incidence.







The following data represent the results of stool examinations conducted by the Commission on school children in Chiba and Ibaraki Prefectures.

Table 2. Incidence of *S. japonicum* and other helminth parasites in school children (ages 8 to 14 years) examined by Commission on Schistosomiasis in Chiba and Ibaraki Prefectures.

Parasite	No. pers. Exam'd.	Males			Females		
		No. Number	% Inf'd.	Total Inf'd.	No. Number	% Inf'd.	Total Inf'd.
Sakura School - Sakura Town							
<u>S. japonicum</u>	63	1	1.47	31	1	3.2	37
<u>A. lumbricoides</u>	68	24	35.3				0
<u>Hookworm</u>	68	17	25.0				
<u>Trichuris</u>	68	5	7.4				
<u>Trichura</u>							
<u>Enterobius</u>	68	1	1.5				
<u>vermicularis</u>							
<u>Hymenolepis</u>	68	1	1.5				
<u>nana</u>							
<u>Negative</u>	68	33	48.5				
Sakura School - Gade village							
<u>S. japonicum</u>	46	0	0				
<u>A. lumbricoides</u>	46	13	28.3				
<u>Hookworm</u>	46	8	17.4				
<u>Trichuris</u>	46	3	6.5				
<u>Trichura</u>							
<u>Enterobius</u>	46	2	4.3				
<u>vermicularis</u>							
<u>Hymenolepis</u>	46	1	2.2				
<u>nana</u>							
<u>Negative</u>	46	24	52.2				







Table 2 (Contd)

Parasite	Males				Females			
	No pers Exam'd	Number Infec'd	Percent Infec'd	Total No Infec'd	Total No Infec'd	Percent Infec'd	Total No Infec'd	
<u>Sakura School - Nago Village</u>								
S japonicum	51	0						
A lumbricoides	51	13	37.3					
Hookworm	51	7	13.7					
Trichuris trichiura	51	0	0					
Negative	51	25	49.0					
<u>Toyoshima School</u>								
S japonicum	76	1	1.3	25	1	4.0	50	
A lumbricoides	76	49	64.5	26			0	
Hookworm	76	7	9.2					
Trichuris trichiura	76	5	6.6					
Enterobius vermicularis	76	2	2.6					
Clonorchis sinensis	76	3	3.9					
Negative	76	20	26.3					
<u>Kita-Savara School</u>								
S japonicum	81	1	1.2	37	0	0	44	
A lumbricoides	81	72	88.9				1	
Hookworm	81	4	4.9					
Trichuris trichiura	81	16	19.8					
Clonorchis sinensis	81	5	6.2					
Negative	81	8	9.8				2.3	
<u>Moriyama School</u>								
S japonicum	68	0	0					
A lumbricoides	68	47	69.1					
Hookworm	68	10	14.7					
Trichuris trichiura	68	4	5.9					
Enterobius vermicularis	68	2	2.9					
Clonorchis sinensis	68	5	7.4					
Metagonimus sp.	68	2	2.9					
Negative	68	12	17.6					







It will be noted that the stool samples from the Sakura School are divided into three sections, those from children from the Town of Sakura and those from children in the villages of Wada and Nego. These villages are a few miles from Sakura in an area in which schistosomiasis is supposed to be endemic. However, no infections were found in the children from these villages and it is possible that the infection has died out or is at a very low ebb in these villages.

The information obtained from these stool surveys supplements that obtained from the health authorities of Chiba Prefecture. It indicates that the disease is still present in the Sakura community and in the Sawara area as described above even though the incidence is at a very low level compared to other endemic areas in Japan.

(c) Snail collections in the endemic areas in Chiba and Ibaraki Prefectures. Search was made for the snail intermediate host of S. japonicum in rice fields, drainage ditches, and in the Imba-Numa swamp northwest of Sakura for a distance of approximately one mile beyond the town. Several species of snails were found but no specimens of Katayama nosophora were recovered. Snail surveys were conducted also in Toyoshima Township and in the Kita-Sawara area, as well as on an island in the Tone River north of the City of Sawara. Snails of the genera Bythinia and Melania were found but no specimens of K. nosophora could be located. Failure to find the snail intermediate host in areas adjacent to towns and villages in which the disease was demonstrated to occur indicates that it is only sparsely distributed throughout the endemic zones. This is in contradistinction to most of the other areas surveyed by the Commission in Japan in which little difficulty was encountered in collecting the snail in regions in which the disease occurs. The low incidence rate of schistosomiasis in the Tone River area is no doubt associated with the sparse distribution of the snail intermediate host. This scarcity cannot be associated with control measures since little work of this nature has been carried out in this region. A limited effort was made in this direction between 1928 and 1931 when lime was applied to the irrigation ditches and a flame thrower used on the sides of the ditches and canals in Higashikatsushika County around the villages of Tanaka, Tonise, and Abiko, and near the village of Nego, Imba County. However, the work was not continued and probably had little influence on the distribution of the snail.

(d) Morbidity and mortality in the Tone River area. Little specific information was available on these points. Local physicians informed us that a flood inundated a large part of the Tone River Valley in July 1927, and a large number of K. nosophora were washed into the Sawara area. Within two months, 120 cases of schistosomiasis developed, all of which were acute and characterized by typical schistosome dermatitis





and fever. Three years later (1930), a similar flood occurred and six cases developed at Kissa, a small town in Ibaraki Prefecture, about 5 miles up the Tone River from Sawara. In 1939, a similar circumstance occurred and this flood was followed by the development of 21 acute cases in and near Sawara. In 1943, two acute cases developed in Moriyama, a small village about 12 miles down the Tone River from Sawara. As noted above, no positive findings were obtained from school children in this village.

(e) Chemotherapy employed in the Tone River area. Because of the apparent low morbidity rate of schistosomiasis in this area, physicians are seldom called upon to treat cases of the disease and little information was obtained on this point.

8. Surveys in the Kofu area, Yamanashi Prefecture. Accompanied by Dr. Nobutaro Ishii, Chief, Research Laboratory of Parasitology, Government Institute for Infectious Diseases, and his assistant, Miss Yasuko Mitoma, the entire personnel of the Commission worked in the Kofu area between 1 and 4 November. Major Bang returned to that area and continued work between 7 and 15 November.

The only information which the Commission could obtain from national health authorities concerning the incidence of infection in the Kofu area prior to its investigation is as follows:

	<u>Number of persons examined</u>					<u>Percent positive</u>
<u>1925</u>	<u>1926</u>	<u>1927</u>	<u>1928</u>	<u>Total</u>		
698	494	630	203	2024		6.79

At Kofu, conferences were held with Dr. M. Ienaga, Chief, Public Health Section, Yamanashi Prefecture, and Dr. Sakurō Sugiura, who operates a private hospital at Showa-Mura, within the endemic area. Mr. Y. Miyoshi, Head, Schistosomiasis Control Office, Yamanashi Prefecture, furnished much valuable information and accompanied the party during its investigations.

(a) General description and extent of infection. The endemic area of schistosomiasis in the Kofu basin comprises approximately 93 square miles. (Map II) The average altitude of the area is about 400 meters but cases of the disease and the snail intermediate host have been found at Mutsusawa, 600 meters above sea level. This area has long been known as an endemic center of the disease, in fact even before the <sup>nature</sup> ~~cause~~ of the disease was determined and its etiology established. It was here in 1904 that Katsurals discovered the parasite Schistosoma japonicum.





In cooperation with the national government, a control program on schistosomiasis was inaugurated in 1943 with an appropriation by the Prefectural government of 1,000,000 Yen over a three year period. In addition, the national government pledged 130,000 Yen per year for the work; this sum is said to have been received by the Prefectural government but never devoted to the purpose for which intended.

At the present time, the endemic area comprises three sections, viz: (1) a so-called control area in which banks of streams and rice paddies were treated 3 years ago with calcium cyanamide at the rate of about 500 pounds per acre; (2) an area under control in which application of the chemical was made last year; (3) an area in which no chemical has been applied. Calcium cyanamide, known to the Japanese as "lime nitrogen", was one of the chemicals tested by the Commission against Oncomelania quadrasi, the intermediate host of Schistosoma japonicum in the Philippine Islands. It was found to be very effective against this species of snail when applied at the rate now being employed in the Kofu area. In this area, application is made about 2 months before the rice is planted in May. Since calcium cyanamide has a high fertilizing value, there are two distinct advantages to its use.

The Commission was told that a material reduction had been made in the incidence of schistosome infection in the control area and that some reduction <sup>had</sup> been effected in the area under control, although it had not been possible to make more than one application of the chemical because of a shortage of supply and insufficient funds for its purchase. The original plan for control called for the application of the chemical to the endemic area each year and undoubtedly it would be much more effective if repeated at intervals.

As part of the control program, stool examinations are carried out in four control stations which employ a total of 15 girl technicians. These technicians are given training for one month and then work under the close supervision of competent microscopists for a period of 5 additional months before being permitted to continue on their own responsibility.

Most of the infection in the Kofu area is contracted through working in the rice paddies. Bathing in streams in the endemic zone is prohibited by health department regulation but nevertheless some such bathing is done. Drinking water is invariably obtained from artesian wells. Many farmers wear two pairs of trousers when working in the rice fields and this is said to provide protection against infection. The local health authorities also recommend the wearing of rubber boots.





The population of the endemic area is 284, 987. Between 1 May 1944 and 30 April 1945, a total of 160,906 stool examinations were conducted by the control stations, of which 10,597 or 6.55 percent, were positive for S. japonicum. All of these examinations were made by means of a single fecal smear with what the Commission would regard as inadequate microscope equipment. A breakdown of the examination figures is given in the following table:

Table 3

Results of stool examinations for Schistosomiasis in Kofu area

Area	Number persons examined	Number persons positive	percent positive
Control (Red on map)	81,031	5,026	6.20
Under control (Yellow on map)	57,013	2,983	5.23
Uncontrolled (Blue on map)	22,862	2,588	11.32
Totals	160,906	10,587	6.57

In addition to stool examinations on the population in the endemic area, the Prefectural Health authorities have conducted stool and postmortem examinations of certain domestic and wild animals in the zone. The evidence obtained would seem to indicate that such animals are responsible to a considerable extent for the transmission of infection to the snail intermediate host. The results of these examinations are as follows:

Table 4

Results of examinations for schistosome infection in lower animals in the Kofu area between 1 May 1944 and 30 April 1945

Species	No examined	No positive	percent positive
Cattle	7059	2184	30.8
Goats	1118	158	14.1
Dogs	353	176	50.0
Horses	967	0	0
Rats (probably including field mice, <u>Microtus</u> spp.)	1707	656	36.7
Moles	68	13	19.0
Skunks	10	9	90.0





(b) Examination of school children for schistosomiasis. On the basis of information furnished by the Chief of the Health Section, Prefectural Government, the Commission selected four schools, two in the so-called control area and two in the uncontrolled area for obtaining stool samples for microscopic examination. Information was obtained from the Prefectural government concerning the incidence of infection in children in these schools as revealed by stool examinations between the period 1 May 1944 and 30 April 1945. This information is summarized in the following table.

Table 5. Incidence of schistosome infection in certain schools selected by the Commission for study, based on examinations by Yamanashi Prefectural Government, 1944-1945.

Name of School	No. pupils examined	No. positive	% Positive
<u>So-called control area</u>			
Shiozaki	2305	560	24.3
<del>Y</del> uo R	2833	627	22.13
<u>Uncontrolled area</u>			
Okamada	1177	267	22.7
Sancho	876	284	32.95
TOTALS	<u>7191</u>	<u>1738</u>	<u>24.2</u>

The following data represent the results of stool examinations conducted by the Commission on school children in the Kofu area.





Table 6. Incidence of *S. japonicum* and other helminth parasites in school children (ages 5 to 15 years) examined by Commission on Schistosomiasis in Kofu area.

Parasite	No. pers. Examined	MALES				FEMALES			
		No. in- fected	% in- fected	Total Number	No. in- fected	% in- fected	Total Number	No. in- fected	% in- fected
<u>Shiozaki School</u>									
<i>S. japonicum</i>	100	57	57.0	57	33	57.9	43	24	55.8
<i>A. lumbricoides</i>	100	32	32.0						
Hookworm	100	19	19.0						
<i>Trichuris trichiura</i>	100	48	48.0						
Negative	100	5	5.0						
<u>Ryuo School</u>									
<i>S. japonicum</i>	133	51	38.3	66	28	42.4	67	23	34.3
<i>A. lumbricoides</i>	133	102	76.7						
Hookworm	133	36	27.1						
<i>Trichuris trichiura</i>	133	46	34.7						
Negative	133	9	6.8						
<u>Okamada School</u>									
<i>S. japonicum</i>	106	64	60.4	54	44	81.5	52	20	35.7
<i>A. lumbricoides</i>	106	88	83.0						
Hookworm	106	34	32.1						
<i>Trichuris trichiura</i>	106	21	19.9						
Negative	106	8	7.5						
<u>Sancho School</u>									
<i>S. japonicum</i>	119	73	61.3	55	35	63.6	64	33	60.9
<i>A. lumbricoides</i>	119	98	82.4						
Hookworm	119	35	29.4						
<i>Trichuris trichiura</i>	119	33	27.7						
Negative	119	4	3.4						
<u>Totals for all schools</u>									
<i>S. japonicum</i>	453	245	55.5	233	140	60.1	226	105	46.5
<i>A. lumbricoides</i>	458	370	80.8						
Hookworm	458	124	27.1						
<i>Trichuris trichiura</i>	458	148	32.4						
Negative	458	26	5.7						





It will be seen that the incidence of schistosome infection in children in the four schools in question was nearly twice that obtained in examinations in the same schools by the Prefectural Health Department. The great difference in the number of examinations by the respective agencies renders impossible a comparison of results. However, for the reason that the plain sedimentation technique is much more efficient than is the fecal smear technique, it would seem that the actual incidence of infection in the children is much higher than that found in the Health Department surveys and in all probability more nearly approaches the figure recorded in the surveys of the Commission.

(c) Snail collections in the Kofu area. Snail collections were made in the vicinity of Karijo and Kokuyo villages south of Kofu City. Numerous specimens of Katayama nosophora, the snail intermediate host, were found without difficulty along the margins of the irrigation ditches and in one place along the edges of the rice paddies. On the return to the Tokyo laboratory of the Commission, 200 snails were crushed and examined for schistosome cercariae; 3 snails were found infected.

(d) Morbidity and mortality in the Kofu area.

It was not possible to obtain records of morbidity or mortality from the Prefectural Health Department. Dr. Sugiura stated that he treated approximately 2,000 patients a year and many more patients are probably treated in the Yamanashi Hospital, other private hospitals, and in the public health dispensaries. Likewise, little information could be obtained concerning age distribution of clinical schistosomiasis in the area. The following data were furnished Major Bang by Dr. Sugiura in connection with patients treated by him in September 1944.

Table 7 - Age distribution of clinical schistosomiasis in 505 patients.

Age Group	Total number	Number of males	Number of females
1-5	23	21	2
6-10	95	85	10
11-15	48	41	7
16-20	24	11	13
21-25	34	13	21
26-30	46	18	28
31-35	29	9	20
36-40	28	15	13
41-45	43	21	22
46-50	50	23	27
50 and over	35	37	43
TOTALS	505	294	211





The number of cases involved is not sufficient to make the figures statistically significant. However, the data bear out the impression gained from the stool examinations that males are more frequently infected than females, possibly because they are employed to a greater extent in the rice fields and because they are more prone to fish and swim in infested water. The relatively large number of cases in males in the age group 6-10 probably represents acute infections contracted for the first time while the similar number of cases in the age group over 50 is no doubt indicative of chronic infections resulting from repeated exposure over a long period of time.

(c) Chemotherapy employed in the Hofu area. Certain information was obtained concerning chemotherapeutic methods employed in the treatment of schistosomiasis in this area. Dr. Saburō Sugiura employs "Stibnal", a Japanese manufactured preparation, said to contain 0.3 percent antimony in the form of sodium antimony tartrate in solution. The first dose is 10 cc, the second 15 cc, followed by 20 cc each for a total of 20 doses. Acute cases usually respond well to this treatment while chronic cases usually fail to show much improvement.

One of the public health dispensaries visited by the Commission used "Fuadin" in the treatment of the disease, the product having been produced by the I. G. Farbenindustrie Aktiengesellschaft, Leverkusen-am-Rhine, Germany. A considerable supply of the drug was on hand. The initial dose was 1.5 cc, the second dose 3.5 cc, and the following doses 5.0 cc each. The drug is given every other day for 30 days for a total dose of 75.0 cc. This course of treatment has been employed for the past 5 years. It is an interesting commentary that for several weeks cases of schistosomiasis in American military personnel on Leyte were given a total dose of 40 cc of "Fuadin", until it was found through experience that such dose was insufficient. The total dose was then raised to 75 cc.

9. Surveys in the Numazu area, Shizuoka Prefecture. This area was surveyed by one member (WHW) of the Commission on 3 and 9 November, in company with Dr. N. Ishii of the Government Institute for Infectious Diseases.

(a) General description and extent of infection. The endemic area in the vicinity of Numazu (Map III) covers about 10 square miles and extends from a mile to the east of the town of Numazu westward as far as Yoshiwara. It is bounded on the north by the back road between these two towns and on the South by the main road (Tōkaidō Highway) and the railroad (Tōkaidō Main Line) which follows the shore line of Suruga Bay. On the north the area extends to the foothills of Mt. Ashitaka and in general borders the Numa River which rises in this mountain and flows into Suruga Bay at Suzukawa.





The entire area is only about 10 miles long and approximately 1 mile wide. Much of the area was a swamp, known as Fukushima, which was drained three years ago, and is now devoted to rice culture. There is a general impression among local physicians and among the inhabitants of the nearby villages that the schistosomiasis morbidity rate has been materially reduced since the drainage of the swamp.

Previous data concerning the incidence of infection in the area was published in 1933 and included the results of 1113 stool examinations made between 1920 and 1925, and 200 examinations made in 1926; of the total of 1313 examinations, 3.98 percent of the individuals were positive for Schistosoma japonicum.

(b) Examination of school children for schistosomiasis. After conferences with local officials, the Sudo Primary School was selected and arrangements were made to secure stool samples from the children. This school is in the heart of the endemic zone and examination of pupils would probably provide more significant incidence figures than obtainable elsewhere in the area. There were 1150 pupils in this school from the village of Sudo and the surrounding country. The following table presents the results of the stool examinations.

Table 3. Incidence of S. Japonicum and other helminth parasites in school children (ages 11 to 13 yrs) at Sudo in the Numazu area.

Stool in the Panama area.				Males		Females			
Parasite	No. pers. exam'd.	No. in- fected	% in- fec'd.	Total	No. in- fec'd.	% in- fec'd.	Total	No in- fec'd	% in- fec'd.
<u>S. japonicum</u>	155	14	9.0	65	12 <sup>+</sup>	18.5	83	1	1.2
<u>A. lumbricoides</u>	155	143	92.3						
Hookworm	155	7	4.5						
<u>Trichuris trichiura</u>	155	35	22.6						
<u>Enterobius vermicularis</u>	155	2	1.3						
<u>Paragonimus westermani</u>	155	1	0.6						
Negative	155	9	5.8						

<sup>+</sup>The sex of one positive individual is unknown.

(c) Snail collections in the Numazu area. Snail collections were made near the village of Sudo immediately to the east. No snails were found in the rice paddies or in the irrigation ditches. However, numerous N. nosophora were located on the borders of a small swampy area, which had apparently not





been drained thoroughly and was not under cultivation, although it was surrounded by cultivated land. A total of 315 snails was examined for schistosome cercariae, 100 by crushing and 215 by placing them in individual containers and observing them for the emergence of cercariae on two days with an interval of two days between observations. Of the 315 snails, 2, or 0.63 percent, were found infected. Dr. Ishii supplied the information that Mr. Y. Miyoshi, Head of the Schistosomiasis Control Office of Yamaguchi Prefecture had collected snails in the Numazu area in 1944 and found 13 percent infected. This is said to be a much higher rate of infection than found at Kofu.

(d) Morbidity and mortality in the Numazu area. No information concerning these points could be secured from the local health officer and time was not available to proceed to Shizuoka, the Prefectural capital, in an effort to obtain such information from the Prefectural health authorities. Dr. M. Ona of the Fuji Hospital, a private institution at Yoshiwara, stated that he had been located there for 16 years and that during the past three years he has treated on an average of 5 to 6 cases each year, whereas formerly the number of patients was double these figures. He attributes the reduction of cases to the draining of the Fukishima Swamp with the resulting decrease in exposure.

(e) Chemotherapy employed in the Numazu area. Dr. Ona uses "Stibnal" in the treatment of schistosomiasis, giving 10 cc of a solution containing 0.3 gram of antimony in the form of sodium antimony tartrate, every day for seven days and then every other day for a total of 16 to 20 doses. He claims good results in acute cases, although chronic cases fail to respond well.

10. Surveys in the Kurume area, Saga and Fukuoka Prefectures, Island of Kyushu. The Commission departed Tokyo 1910 hours, 15 November, and arrived at Kurume 1350 hours, 17 November. Headquarters were with the 27th Marine Regiment, 5th Marine Division. The Commission is indebted to Colonel Thomas Wornham, CO, for the courtesies and facilities extended in the way of quarters, rations, and transportation during its stay in the Kurume area. Lt Colonel Donn J. Robertson, Executive Officer, 1st Lieutenant Leslie F. Fultz, S-1, Captain Francis J. Fultz, S-4, Lt Commander Thomas E. McGeachy MC, Regimental Surgeon, Lieutenant (jg) George Levy MC, and Lieutenant (jg) A. Littman MC, rendered valuable assistance to the work of the Commission, while 1st Lt Richard Woodard and Pfc Dewitt Trowbridge acted as interpreters. Miss Sumiko Nakane also served as interpreter. Work in the area was carried on between 17 and 22 November.

At Kurume conferences were held with Mr. Monzo Uno, officer in charge, Health Department, Kurume City, and with Dr. T. Inoue





who conducts the Inoue Hospital, a private institution. A visit was made also to the Kyushu Medical School at Kurume and various members of the faculty interviewed. At Saga, Mr. H. Yokota, Chief of Foreign Affairs, and Dr. S. Sumita, Chief of the Sanitary Section, Saga Prefecture, supplied valuable information.

(a) General description and extent of infection. The endemic area of schistosomiasis centered around Kurume in general follows the course of the Chikugo River (Map IV). The area extends approximately 12 miles from east to west and approximately 9 miles from north to south at its greatest length and breadth; it covers approximately 100 square miles and lies within the Counties (Gun) of Mii and Miyaki.

No sustained program of control has been carried out in the area, although we were informed that lime was tried at one time without avail. The Chief of the Sanitary Section, Saga Prefecture, stated that before the war he had inaugurated a program of sanitary privy construction aimed at the control of schistosomiasis but that this work had been interrupted. He had devised a type of privy involving the use of three separate septic tanks in successive compartments so that the fecal material would be carried over from one compartment to another before being used as night soil. He had found by experimental work that the time required for the passage of the fecal material through the three compartments permitted the natural destruction of schistosome and other helminth ova. This official recommends that human feces be permitted to stand in open containers for six months before being placed on the fields. However, he stated that few farmers follow his recommendations and that little has been accomplished from such a measure in the way of control.

Dr. Inoue has conducted a considerable amount of research work on schistosomiasis and was able to give the Commission valuable information. He also accompanied the Commission into the field for the collection of the snail intermediate host. In one of his papers, "The results of researches in schistosomiasis japonicum in connection with the skin reaction in school children" (free English translation) published in the Journal of the Kyushu Medical School, January 1942, he cited figures for certain surveys carried out in the endemic area. The results cited are as follows:





Table 9. Results of skin tests and stool examinations by Dr. T. Inoue in the endemic area of schistosomiasis around Kurume. (1940)

Skin reactions					Stool examinations <sup>†</sup>						
Town	Number Tested	No. Pos.	%	<u>S. japonicum</u>		<u>Ascaris</u>		<u>Hookworm</u>		<u>Trichuris</u>	
				positive	%	positive	%	positive	%	positive	%
Nagatoishi	125	74	59.2	50	67.6	14	18.9	4	5.4	13	17.6
Asahi	975	330	33.8	29	8.8	190	58.8	75	22.7	76	23.0
Minamishigeyasu	471	128	27.2	5	3.9	55	43.0	11	8.6	25	19.5
Kyomachi	379	46	12.1	1	2.2	3	15.2	0	0.0	2	4.3
Torihai School	322	151	18.4	15	9.9	37	24.5	9	6.0	11	7.3

<sup>+</sup>Single fecal smear

Further information was obtained concerning infection in the endemic area from another paper published by Dr. Inoue in the Journal Kyushu Medical School, 1940. This paper, entitled "Examination of elementary school children for schistosomiasis in an endemic area in Japan together with results of intradermal tests", (free English translation) contained results of stool surveys conducted at various times within the area. The data are translated as follows:

Town	Date survey	Table 10. <sup>+</sup>		
		No. examined	No. positive	Percent positive
Kiyama	1921	276	2	0.7
Fumoto	1921	130	4	2.2
Kizato	1921	135	47	25.4
Tosu	1921	333	116	34.9
Asahi	1921	147	31	55.1
Kitashigeyazu	1921	301	35	11.6
Minamishigeyasu	1921	120	9	7.5
Nagatoishi	1919	776	455	59.6
"	1924	80	46	57.5
"	1924	56	22	44.0
"	1927	693	332	47.5
"	1933	115	38	33.1
"	1934	115	49	42.6
"	1934	1062	140	17.7
		2897	1082	37.3

(<sup>+</sup>Table 10 - Results of stool examinations for schistosomiasis in the endemic area in Saga and Fukuoka Prefectures. (data from paper by Dr. T. Inoue).)





<u>Town</u>	<u>Date survey</u>	<u>No. examined</u>	<u>No. positive</u>	<u>Percent positive</u>
Miyanozin	1919	158	53	34.4
"	1924	142	24	16.9
"	1931	323	152	24.4
Yamakawa	1930	179	1	0.6
"	1931	1305	1	0.1
Ogoyi School	1925	74	10	13.5
Yuge School	1930	177	14	7.9
Ogi School	1930	238	1	0.4
Kushiwara	1930	128	20	15.5
Modo	1935	620	125	20.2
Azisaka	1921	513	296	58.7
Fukuda	1934	1375	24	1.7
"	1935	2152	36	1.7

The following data were furnished by the Chief of the Sanitary Section, Saga Prefecture, and represent results of surveys conducted by Prefectural Health authorities during 1943 and 1944.

Table 11. Results of stool surveys for schistosomiasis conducted by Health Department of Saga Prefecture 1943-1944.

<u>Town</u>	<u>Date survey</u>	<u>No. examined</u>	<u>No. positive</u>	<u>Percent positive</u>
Kizato	1943	360	62	17.2
"	1944	370	62	16.8
Tosu <sup>+</sup>	1943	474	89	18.8
"	1944	474	89	18.8
Asaki	1943	619	117	18.9
"	1944	1481	235	15.9
Kitashigeyazu <sup>+</sup>	1943	420	19	4.5
"	1944	420	19	4.5

<sup>+</sup>There appears to be some repetition of figures in these data in that in two towns the same number of individuals with the same number of positives is recorded for both 1943 and 1944. However, the interpreter insisted that the data are correct.

The following information was taken from the Annual Report, Prefectural Health Officer, Fukuoka Prefecture, for 1942.

Table 12. Stool examinations for schistosomiasis conducted by Fukuoka Prefecture, 1942.

<u>Town</u>	<u>Date survey</u>	<u>No. examined</u>	<u>No. positive</u>	<u>Percent positive</u>
Kurume City	1942	244	32	13.1
Yamanato	1942	1926	2	0.1





The information furnished by the results of stool examinations in this endemic area over the past 20 years would seem to indicate that the distribution of the disease is spotty in nature in that some areas have a high incidence rate and other areas a low incidence rate. The data indicate further that there has been little apparent reduction in the incidence of infection in the area over the period in question.

(b) Examination of school children for schistosomiasis.  
After consultation with Dr. Enoue and a consideration of the available data, three schools were selected from which to obtain stool samples from the pupils. These schools were as follows: Nagatoishi and Ajisaka, Fukuoka Prefecture, and Tosu, Saga Prefecture. Information concerning the incidence of past infection was available from previous surveys and the schools were distributed throughout the heart of the endemic area. The following are the results of the examinations.

Table 13. Incidence of *S. japonicum* and other helminth parasites in school children (ages 8 to 13 yrs) examined by Commission on Schistosomiasis in the Kurume area.

Parasite	MALES			FEMALES		
	No. Exam'd.	No. in- fect'd.	% in- fect'd.	No. in- fect'd.	% in- fect'd.	No. in- fect'd.
(Nagatoishi School, Fukuoka Prefecture)						
<i>S. japonicum</i>	114	49	43.0	60	32	53.3
<i>A. lumbricoides</i>	"	43	42.1	54	17	31.5
Hookworm	"	3	2.6			
<i>Trichuris trichiura</i>	"	4	3.5			
<i>Enterobius vermicularis</i>	"	2	1.8			
Negative	"	30	26.3			
(Ajisaka School, Fukuoka Prefecture)						
<i>S. japonicum</i>	119	23	19.3	59	17	28.8
<i>A. lumbricoides</i>	"	81	68.1	60	6	10.0
Hookworm	"	10	8.4			
<i>Trichuris trichiura</i>	"	13	10.9			
<i>Enterobius vermicularis</i>	"	0	0.0			
Negative	"	24	20.2			



(continued)

Parasite	No. Exam'd.				MALES		FEMALES	
		No. in-	% in-	Total	No. in-	% in-	No. in-	% in-
		fec'd.	fec'd.		fec'd.	fec'd.	fec'd.	fec'd.
(Tosu School, Saga Prefecture)								
<i>S. japonicum</i>	95	13	13.7	49	9	18.4	46	4
<i>A. lumbricoide</i> s								8.7
"		66	69.5					
Hookworm	"	6	6.3					
<i>Trichuris trichiura</i>								
"		5	5.3					
Negative	"	21	22.1					

Insofar as could be learned, all previous surveys in the Kurume area were based on a single fecal smear. The difference in techniques and differences in numbers examined make it difficult to draw any comparison between the results obtained by the Commission and those obtained in previous surveys. However, it is evident that there has been little, if any, decrease in the schistosomiasis infection rate in the areas in question over the period represented by the several surveys.

(c) Snail collections in the Kurume area. Collections were made in the area immediately to the east of Ichibaru, in rice paddies and irrigation canals near the Chikugo River. Here numerous specimens were found in the irrigation ditches and in one area the snails were located in abundance around the stems of rice plants previously harvested. It was apparent that the irrigation canals had flooded and washed the snails into the paddies since the stems of the plants were bent over by the rush of the water. Snails were located in areas five to six feet outward from the canals. Collections made near Ajisaka school revealed only a few specimens. In an area about 1/2 by 1/4 mile near Nishida, snails were numerous in the small irrigation canals even though the area was well drained and most of the ditches dry; about 1000 snails were collected in this area. None was found in the rice paddies as at Ichibaru. Very few *K. posophora* were located in an area south of Tosu, although search was made at numerous places beginning 2 kilometers south of the town and working almost to the town limits. However, immediately to the east of the village of Sonezak about 800 snails were collected in an irrigation ditch which was entirely dry. These collecting stations are marked on Map IV. The following are the results of the examination of samplings of snails for schistosome cercariae:





Table 14

Results of examination of K. nosophora for schistosome cercariae (Kurume area). Collections made by Commission on Schistosomiasis.

Area	No snails examined	No with mature <u>S. japonicum</u>	No with immature forms	Percent infec'd	No with cercariae of other species of trematodes
Tosu-Sonezak	210	16	4	9.52	9
Kurume-Nishida	200	4	4	4.0	1
Kurume-Ichibaru	100	7	0	7.0	0

The following information concerning infection rate in snails was obtained from a paper entitled "Result of investigations on the ecology of the snail Katayama nosophora, along the Chikugo River in Kurume City" (free English translation) by Kōnosuke, G. Fujizawa, Y. Kubo, Kin An Han, Y. Miyazaki, S. Nakano, S. Nagazato, T. Ozawa Rin To Sho, Lo Zai Ben, and Sai Shu Go, published in the Journal of the Kyushu Medical School, April, 1942.

Matsubara,

Table 15

Results of examinations of snails in the Kurume area for cercariae of S. japonicum

Area	No collecting stations in area	Percent <u>S. japonicum</u> infection in snails
Kurume-Nishida	2	0 to 7.3
Kurume-Nagatoishi	6	0 to 30.0
Miyaki-Gun (County)	8	0 to 2.17
Fukuoka Prefecture	9	0 to 6.45

In the experience of the Commission, infection rates in snails such as those cited above indicate very marked foci of schistosomiasis in the population. It is believed also that such rates indicate that there has been little reduction within recent years of the schistosomiasis incidence rate in the community.





(d) Morbidity and mortality in the Kurume area.

The Chief of the Sanitary Section, Saga Prefecture, advised that there had been reported in that prefecture an average of 395 cases of clinical schistosomiasis per year during the past 5 years. The schistosomiasis morbidity rate in Saga Prefecture is 134 per 10,000 population. Similar data were not available for Fukuoka Prefecture, but would probably not vary widely from the Saga Prefecture figures, since part of Fukuoka Prefecture contains some highly endemic foci of the disease.

No information was available concerning the mortality from the disease. Dr. Inoue stated that he treated about 80 cases of the disease per year in his hospital; the age of the patients usually ran between 9 and 18 years. He had no definite information concerning the number of deaths traceable to schistosomiasis but believes that there are very few.

(e) Chemotherapy employed in the Kurume area. Dr. Inoue advised that he employed "Nerobosan" in the treatment of schistosomiasis. This is a p-aminophenylstibinate derivative containing in each ampoule .05 gram of antimony and manufactured by Banyu Pharmaceutical Co., Ltd., Honcho, Nihonbashi, Tokyo. He uses 1 ampoule every 3 days for a total dose of 0.1 to 0.15 gram. Good results are said to be obtained in acute cases.

11. Survey of Fukuyama area, Hiroshima and Okayama Prefectures. The Commission departed Kurume 0715 hours, 22 November and arrived Fukuyama 2315 hours, same date. Headquarters were established with the 3d Battalion, 162d Infantry, 41st Infantry Division, and appreciation is accorded Captain John E. Norton CO, for courtesies extended in the way of quarters, rations, and transportation. Miss Emiko Fujii acted as interpreter for the Commission during its stay at Fukuyama. The survey in this area was carried out between 22 and 27 November.

(a) General description and extent of infection. The endemic area is situated immediately to the north of the City of Fukuyama and lies partly in Hiroshima and partly in Okayama Prefectures (Map V). It is approximately 13 miles in extent from northeast to southwest and approximately 5 miles wide at its greatest breadth. In Hiroshima Prefecture, the area includes all or part of Ekiya, Hubeiyama, Miyuki, Michinque, Kannabe, Senda, Mino, Yuda, and Takehiro Townships, although the center of the area lies in Miyuki, Kannabe, and Mino Townships. In Okayama Prefecture, the infection occurs mainly in Takaya Township. The outline of the area on Map V as the endemic zone is based on information received from many sources. The disease is probably absent from many parts of the area but the boundaries mark the limits within which due precautions should be taken by military personnel to escape infection.





During the investigations of the Commission, numerous persons were interviewed in an effort to gain information concerning the extent of infection and other phases of the problem. Much of the early research work on schistosomiasis took place in this area around the village of Katayama, from which village the disease takes its name. In 1904 in an autopsy in Yoshida Hospital at nearby Haga, Fujinami recovered the first female S. japonicum from man. Organized control work was undertaken in 1918 by the "Association for the Eradication of Endemic Disease", an association which comprises 8 villages. The association had three objectives, viz: Education of the population with the view of preventing acquisition of the disease; the use of lime on irrigation ditches and rice fields for the destruction of the snail intermediate host; and the substitution of horses for oxen as draft animals in the area for the reasons that the former are more resistant to infection and seldom pass ova of the parasite in the feces. Until 1938, this association supervised all control work in the area; in that year, supervision reverted to the Health Department of Hiroshima Prefecture. In the calendar year 1944, a total of 50,000 Yen was spent in control work in Hiroshima Prefecture, one-half of this being appropriated by the Prefectural Government and one-half by the association of 8 villages. Dr. Takemaro Kitajima, Health office of Hiroshima Prefecture, advised that in 1943 the program was augmented so that in addition to the lime treatment of irrigation ditches and rice fields some of the ditches were concreted, since it was found that the snails will not live in cemented ditches. However, this program was not in operation in 1944 and 1945 because of the shortage of cement.

Lime is still being used for snail destruction in parts of the area where required. The lime is applied in May at the rate of approximately 10 pounds per 5 to 10 meters of ditch, depending on the size of the ditch. This amount represents about twice that employed in the treatment of experimental plots of the Commission on Leyte where it was found that other chemicals were more effective for the destruction of Oncomelania quadrasi, the snail intermediate host of S. japonicum in the Philippines. There is no question but that attempts to control schistosomiasis in this area have met with considerable success. The distribution of the snail intermediate host has been considerably restricted through the practice of liming and the Commission was unable to find snails in many areas in which they were said to have existed formerly. The educational program carried out by the "Association for the Eradication of Endemic Disease" has no doubt also contributed materially to the control of the disease. Everyone in the area is apparently quite familiar with the disease, its method of transmission, and the species of snail involved in that transmission. Even without an interpreter, it was possible to obtain from almost any man, woman, or child working in the rice





fields in the area accurate information on the distribution of the snail and whether cases of the disease existed in the contiguous village. Charts showing the life cycle of the parasite and containing information in regard to the prevention of the disease were observed in some of the township schools visited by the Commission.

In past years, numerous stool examinations have been made in the endemic area, and other types of surveys conducted in an effort to obtain accurate information on the distribution of infection. Effort was made to obtain information on the results of these surveys from Dr. Takemaro Kitajima, Health Officer, Hiroshima Prefecture, Hiroshima, Dr. T. Miyata, officer in charge Schistosomiasis Control Office, Hiroshima Prefecture, Fukuyama, and Mr. Chaichi Kawai, Assistant to the Health Officer of Okayama Prefecture, Okayama. However, all records were burned during the bombing of these three cities.

(b) Examination of school children for schistosomiasis. After consultation with various authorities, it was decided to obtain stool samples from children in the township schools of Mino, Kannabe, and Miyuki, since these schools draw pupils from the center and from the fringes of the area in which the major portion of the disease is now confined. The following represent the results of these examinations.

Table 16. Results of stool examinations of school children (ages 12 to 14 yrs.) in the Fukuyama area by Commission on Schistosomiasis.

Parasite				Males		Females			
	No. Exam'd	No. Infec'd	% Total Inf.No.	No. Inf.	% Total Inf.	No. Inf'd	No. Inf'd		
<u>Mino-Mura School</u>									
<u>S. japonicum</u>	117	0	0	56	0	0	61	0	0
<u>A. lumbricoides</u>	"	76	65.0						
Hookworm	"	21	17.9						
<u>Trichuris trichiura</u>	"	21	17.9						
Negative	"	27	29.1						
<u>Kannabe School</u>									
<u>S. japonicum</u>	121	19	15.7	57	12	21.1	64	7	10.9
<u>A. lumbricoides</u>	"	49	40.5						
Hookworm	"	10	8.3						
<u>Trichuris trichiura</u>	"	8	6.6						
<u>Enterobius ver-</u> <u>micularis</u>	"	1	0.8						
Negative	"	53	43.8						





Table 16. (Contd)

Parasite	No. Exam'd	No. Infec'd	% Total Inf. No.	Males		Females			
				No. Inf.	% Total Inf. No.	No. Inf'd	No. Inf'd		
<u>Miyaka-Mura School</u>									
<u>S. japonicum</u>	119	15	12.6	60	10	16.7	59	5	8.5
<u>A. lumbricoides</u>	"	63	52.9						
<u>Hookworm</u>	"	13	10.9						
<u>Trichuris trichiura</u>	"	19	16.0						
<u>Enterobius ver-</u> <u>micularis</u>	"	1	0.8						
<u>Negative</u>	"	39	32.8						

The failure to find cases of infection in children at the Mino-Mura School would seem to confirm the impression of health authorities that the disease is at a very low ebb in that township; this conclusion is in keeping also with the failure of the Commission to find the snail intermediate host in this locality. It is apparent that the disease at the present time is centered around Katayama village, an opinion which is fostered by many of the individuals who were interviewed.

(c) Snail collections in the Fukuyama area. A thorough search for the snail intermediate host of S. japonicum was made throughout most of the endemic area. Collecting stations are marked alphabetically on the map. At Station A near the village of Haga very few K. nosophora were found although specimens of Succinia, Planorbula and Melania were collected. This area had been heavily lined, and a considerable amount of lime still remained in the water and along the banks of the irrigation canals. The snail was very common in collecting station B, where there was no evidence that lime had been used. Here some K. nosophora were found in the water of the canals and others were located in rice paddies. The snails were not located in irrigation ditches or rice paddies at collecting station C but were found in a small swampy area measuring approximately 5 x 100 yards; here they were located under a heavy growth of weeds and grass and appeared to be only beneath the surface of the ground. Snails were also found in collecting areas D and E. Beginning above the town of Sacka at collecting area F, surveys were made south to Nanukaichi in Okayama Prefecture and west as far as collecting station J near Mino-Mura School. The area from F to G, the bridge at Ina, was covered by walking through the rice fields and examining the irrigation ditches. Here the ditches were well made, many of them of concrete, while others had concrete or rock sides with natural bottom. The water in these ditches ran swiftly and was quite clear. Very few snails of any kind were seen and no K. nosophora were recovered. Here the soil was more sandy and contained some gravel, in sharp contrast to the heavy black alluvial soil found near the village of Katayama. About the same





conditions were encountered at collecting station H near Manukaichi; no snails were found here or at collecting station I, south of Takaya, although Melania spp. of snails were numerous. At collecting station J near Mino-Mura, no K. nosophora were located although the snail had formerly been endemic here. At area K, north of the town of Kannabe, conditions seemed to simulate more closely those at Katayama. However, the ditches had been heavily lined and no K. nosophora could be found. The first snails in the valley were located at collecting station L to the northwest of the town of Kannabe. The ditches in this area had been lined also but the snails were found in small rectangular swampy areas adjacent to the irrigation canals. These swampy areas may have been abandoned fish ponds. The snails were not numerous in this area. In collecting area M east of Sunahara, a single specimen of the snail was found after a 15 minute search; the ditches in this area had been lined.

In collecting areas N, O, and P, between Chikata Station and Era, the irrigation ditches are deep with steep banks and even in the lateral terminal canals the water flows swiftly, a condition not favorable for K. nosophora; no specimens were found in these areas. Similar conditions were found to prevail in the remainder of this section at collecting stations Q, R, S, T, U, and V, and none of the snails was found in this entire region.

The information obtained from the surveys of the Commission and from Japanese sources would seem to warrant the conclusion that in the Fukuyama area, K. nosophora is quite closely restricted at the present time to a section comprising approximately 4 square miles centering at the junction of the Kamo-gawa and Takaya gawa. The failure of the Commission to locate the snails elsewhere in the Fukuyama area does not necessarily indicate their absence; it does indicate, however, that the center of infection is in the above-mentioned area.

The Commission was advised by Asst. Prof. Sakae Murakami, Okayama Medical School, that in 1936 or 1937 he crushed 300 to 400 snails collected in the area between Katayama and Kannabe and had found about 3 percent infected with S. japonicum. He stated that at the present time the snail was found in Okayama Prefecture only in the vicinity of Takaya.

The following table gives the results of snail examinations by the Commission for cercariae of S. japonicum in specimens collected in the Fukuyama area.





Table 17. Occurrence of cercariae of S. japonicum in Katayama nosophora collected in the Fukuyama area.

Area	No. snails examined	No. positive for <u>S. japonicum</u>	Percent positive	No. positive for cercariae of other trematodes
Kannabe (Station L)	101	16	15.84	0
Katayama (Stations A, B, and C)	200	2	1.0	0
Miyuki (Stations D and E)	200	1	0.5	0

(d) Morbidity and mortality in the Fukuyama area. No information could be obtained on these points for Okayama Prefecture. Mr. Kawai, representative of the Health Department of that Prefecture, stated that all records of his office had been burned in the bombing of the City of Okayama and he did not know whether there were any clinical cases of the disease at the present time.

All records of morbidity and mortality of the disease in Hiroshima Prefecture had also been destroyed in the burning of the City of Fukuyama. However, Dr. Miyata, in charge of the control office at Fukuyama, furnished fragmentary data, as follows:

Table 18. Morbidity and mortality from schistosomiasis in Hiroshima Prefecture, 1941-1945.

Year	No. clinical cases	No. deaths
1941	226	9
1942	About 200	2
1943	1472	No information
1944	401	" "
1945	No information	" "





It was learned that the above-mentioned figures are not based on cases occurring in the private practice of physicians in the area but represent cases diagnosed on physical examination by teams of physicians going from village to village within the endemic area.

Mr. Ryoichi Sato, a veterinarian and president of Miyuki-Mura, stated that it is the general impression that individuals acquire a certain resistance to schistosomiasis through early exposure to the disease. During the war when lime was difficult to obtain, control work in his township had to be neglected. As a result, the number of snails increased and there were a good many clinical cases of the disease in individuals in the teen ages because they were said to have escaped infection at an early age. Mr. Sato told the Commission that during the war many men of military age from his township were rejected for military service because they were suffering from schistosomiasis.

12. The presence of hepatomegaly as an indication of schistosome infection. Major Bang's work with the Commission consisted in evaluating the presence of hepatomegaly or the so-called "liver index" as an indication of schistosomiasis. He chose to submit to the Surgeon General a separate report but has kindly furnished the Commission with a copy of that report. As indicated in the following table extracted from Major Bang's report, he found a close relationship between the occurrence of hepatomegaly and schistosome infection as determined by stool examination.

Table 19. Relation between palpable livers and incidence ~~endemicity~~ of schistosomiasis in children 5 to 15 years of age. (Major Bang's examinations).

Place	Type of area	No. examined	Percent with positive stools	Percent with palpable livers	Liver index
Okamada	Heavily endemic	106	60	50	0.7
Sancho	" "	89	55	59	0.8
Sakura	Lightly endemic	68	1.47	9	0.1
Asakwa	Negative	36	0	3	0.03

The first two mentioned places are in the Kofu area, Yamanashi Prefecture, where schistosomiasis is heavily endemic and where clinical cases probably occur more frequently than in





any other area in Japan. In order to compare results obtained in this area with those from an area where the infection is not so severe, liver palpations were carried out on school children in the Kurume area. The examinations were made by Lieut. (jg) George Levy, MC, USN, and Lt. (jg) A. Littman, MC, USN, 27th Marine Regiment, Fifth Marine Division. The results are given in the following table.

Table 20. Results of liver palpations to determine schistosome infection in school children 7 to 13 years of age.

School	No. individuals examined	No. with stools positive	No. infected with palpable liver	No. not infected with palpable liver
Nagatoishi	114	49	10	13
Ajisaka	119	23	2	5
Toso Saga	95	13	0	3

From the above-mentioned results, it will be seen that more children not infected with S. japonicum showed some degree of hepatomegaly than did children harboring the parasite. In these three schools then, the liver index would have been of little value in disclosing cases of infection with S. japonicum. The difference in these results as compared with those in Table 19 may be due in part to the fact that the examinations were made by different individuals. However, it is probably more related to the fact that the children in the Kurume area do not have as heavy infections as do those in the Kofu area where Major Bang's investigations were carried out. It would seem therefore that the liver index tends to lose its value as a diagnostic measure when the level of infection in individuals in a community is low and not sufficient to produce a high morbidity rate for the disease in that community.

### 13. Summary.

(a) The five known endemic areas of schistosomiasis in Japan have been surveyed by the Commission on Schistosomiasis with the view of ascertaining the extent of these areas and gathering information which would be pertinent to the prevention of this disease in military personnel. The methods employed in the surveys included the compiling of all available information from national, prefectural, and local health authorities, the collection and examination for schistosome ova of stool samples from children in certain representative schools in each area, the investigation of the liver index as an indication of schistosome infection, and the collection and examination of Katayama nosophora, the snail intermediate host of Schistosoma japonicum,





in an effort to determine its distribution within the area and the rate of infection with cercariae of the parasite.

- (b) The endemic areas surveyed were, as follows:
- (1) The Tone River area in Chiba and Ibaraki Prefectures.
  - (2) The Kofu area in Yamanashi Prefecture.
  - (3) The Numazu area in Shizuoka Prefecture.
  - (4) The Kurume area in Saga and Fukuoka Prefectures, Island of Kyushu.
  - (5) The Fukuyama area in Hiroshima and Okayama Prefectures.

The first two areas are in the Eighth Army Command. The last three are in the Sixth Army Command.

(c) Individuals infected with S. japonicum on stool examination have been reported from other areas including Tochigi, Aomori, and Fukui Prefectures. National health authorities are of the opinion that such cases do not represent infection acquired in these prefectures but rather imported infections. A relatively large number of such cases has been reported from Fukui Prefecture (TB Med 100) but it is the view of Japanese health officials and parasitologists that these reports are either in error or represent cases of infection acquired elsewhere. A reply to a specific inquiry into the status of such reports had not been received from the Health Department of Fukui Prefecture at the time this report was compiled. Schistosomiasis was formerly endemic in certain parts of Tokyo Prefecture but it is said that all these foci of infection have now been eradicated.

(d) In view of the limited amount of time allotted the Commission for the work in question, it has not been possible to conduct exhaustive surveys of any of these areas. With the view that more detailed studies should be made, the Commission undertook to train in laboratory and field work one officer and two enlisted men from each of five Malaria Survey Detachments under Eighth Army Command. It is believed that such personnel is capable of carrying on such additional work as is indicated.

(e) The Tone River area, which lies partly in Chiba Prefecture and partly in Ibaraki Prefecture, apparently has the lowest infection rate of any area in Japan. While the disease is still endemic in certain parts of this river valley, it is at a very low ebb and at the present time there is probably very little transmission taking place. The Commission was unable to find specimens of K. nosophora in any place in which a search was made, although the snail undoubtedly still occurs in certain sections. However, the entire river valley from Torito east should be regarded as a suspected endemic area until additional investigations prove otherwise.





(f) From the standpoint of incidence of infection and morbidity rate, the Kofu area, Yamanashi Prefecture, is the most important one in Japan. In spite of the fact that a control campaign has been aggressively carried on in this area for the past three years, it is apparent that little has actually been accomplished in the reduction of the incidence of infection or the number of clinical cases. This area appears to be particularly dangerous from the standpoint of the transmission of infection, since exposure in any part of it would probably lead to clinical cases of the disease. One battalion of infantry is now stationed in the area together with an AMG detachment.

(g) The Numazu area in Shizuoka Prefecture covers only about 10 square miles and is the smallest focus of the disease in Japan. Only 9 percent of 155 children from a school in the center of the area were found infected. Authorities stated that there has been a marked reduction in the number of clinical cases of schistosomiasis in this area since the drainage of a large swamp in the heart of the area three years ago. While all precautions against the acquisition of infection should be taken by military personnel entering the area, the opportunities for the transmission of the disease here are more limited than in most other endemic areas.

(h) The Kurume area in Saga and Fukuoka Prefectures, Island of Kyushu, is the most extensive endemic focus of schistosomiasis in Japan. However, the infection is more spotty than in the Kofu area, some sections showing a high incidence of the infection while in other sections the disease is at much lower ebb. The distribution of the snail intermediate host within the area varies considerably, the snails being found in abundance in the high incidence zones and few in number or absent in certain other sections where the incidence was found to be lower. This situation is apparently due to the operation of natural factors since practically no control work has been carried out in this area. The Chikugo River runs through the heart of the Kurume area; because of its clear water and sandy bottom it would no doubt present an attractive invitation for swimming or washing vehicles to troops not suitably indoctrinated in the prevention of the disease. Furthermore, Kurume is on the main convoy route between principal cities and ports in the southern and southwestern parts of Kyushu to cities in the northern part of the Island occupied by United States Army Forces. At the present time, various units of the Fifth Marine Division are stationed in the endemic area. In summary, the probabilities for the acquisition of schistosomiasis by military personnel in this area are considerable.

(i) The Fukuyama area in Hiroshima and Okayama Prefectures in our opinion ranks third in importance from the standpoint of possible transmission of the disease to military personnel. Through the organized control work which has been carried on in this area over the past 30 years, the disease has





been gradually reduced and the distribution of the snail intermediate host considerably restricted. At the present time, the infection seems to be confined principally to the townships of Kannabe and Miyakê with the center of the focus at the village of Katayama where the disease was first discovered. One battalion of infantry is at present stationed near Fukuyama. The larger streams in the area are very inviting for swimming and bathing and, unless suitable educational measures are carried out, some of the troops stationed near the area and some wandering into the area in all likelihood will sooner or later expose themselves to infection.

(c) The appended maps carry outlines of the present boundaries of the various endemic areas. Such boundaries are predicated on the information furnished the Commission by Japanese health authorities and others and by results of the Commission's own investigations. Effort has been made to place these boundaries at safe limits; undoubtedly some of the information is in error and could only be rectified through detailed surveys by trained personnel. Even though the infection may not occur in all territory included within boundary lines, from a standpoint of preventive medicine all streams and other bodies of fresh water within these lines should be regarded with suspicion and due precautions taken to prevent military personnel coming in contact with such water.

#### 14. Recommendations.

While there is little probability that any appreciable amount of exposure to schistosomiasis will take place during the winter months in Japan, opportunities for such exposure will be considerably enhanced with the advent of warmer weather. In its contacts with the commanding officers and medical officers of units stationed in endemic areas of schistosomiasis, the Commission has endeavored to stress the importance of carrying out a suitable educational program for the prevention of the disease. The following specific recommendations are offered for such consideration as may be deemed advisable.

(a) It would appear desirable that all roads leading into known endemic areas of schistosomiasis be posted warning military personnel that they are entering such an area and to beware of any contact with fresh water within the area. Suitable warning signs should be placed along streams and other bodies of fresh water which are apt to be used for fishing, swimming, bathing, or the washing of clothes or vehicles.

(b) It is recommended that there be carried out, such as was done on Leyte, a suitable educational program of lectures and demonstrations on schistosomiasis, including specific information on the location of endemic areas of the disease. This program should be undertaken without delay for those troops now





stationed in or near endemic areas and extended during the remaining winter months to all military personnel in the occupation forces. Such an educational program should be continuous in nature or at least be carried out at suitable intervals in that it may reach replacements entering the country for the first time. Medical officers themselves should be especially familiar with all aspects of the disease in order that they may supervise such a program within the units to which assigned.

(c) It is the opinion of the Commission that the stationing of large bodies of troops within endemic areas is inadvisable unless dictated by military necessity.

(d) It is believed that further survey work is warranted for the purpose of delimiting more closely the known endemic foci of the disease, and investigating other areas in which the disease may be suspected to occur. It would seem that personnel most qualified to carry on this work is that already given some training by the Commission.

(e) While the ultimate control of the snail intermediate host of schistosomiasis is not of immediate military concern, excellent opportunity is afforded for carrying out investigations in a limited area with one or more of the chemical compounds tested by the Commission on Leyte; research work of this character might contribute information of considerable value from the standpoint of public health and preventive medicine. Such investigations could be undertaken by suitably trained personnel of one of the Malaria Survey Detachments. Information concerning the above-mentioned chemicals can be found in the monthly reports of the Commission, copies of which are in the files of the Chief Surgeon's Office.

(f) It is recommended that any survey or other investigational work which may be undertaken by military personnel be coordinated by a commissioned officer familiar with all phases of the problem in order that duplication of effort may be avoided and the work of various units properly integrated.

#### 15. Acknowledgements.

The Commission wishes to record its appreciation to Brigadier General Guy B. Denit, Chief Surgeon, United States Army Forces, Pacific for the opportunity of carrying out the surveys in question. The Commission is also greatly indebted to Brigadier General George W. Rice, Surgeon, Eighth Army, and Brigadier General Wm. M. Hagins, Surgeon, Sixth Army, for the facilities which they have placed at its disposal and for the encouragement lent to the work. Colonel A. H. Schwichtenberg and other members of the staff of the Advance Echelon, Chief Surgeon's Office, have been particularly helpful in arranging many of the details connected with the work of the Commission and their cooperation is greatly appreciated. Many other







individual members of the occupation forces have given freely of their time and advice. Finally, the Field Director wishes to commend and to thank all individuals connected with the Commission for their untiring services and their devotion to duty over the period of time represented by the work in question.

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Colonel, USPHS,  
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Erratum

Paragraph 7 (b). Two schools (Toyoshima and Kita-Sawara) are in Ibaraki Prefecture. Sakura and Moriyama Schools are in Chiba Prefecture.

Addendum

Paragraph 13 (c). The Health Department of Fukui Prefecture advised the Ministry of Welfare and Social Affairs by telegraph that there are no cases of schistosomiasis in that prefecture at the present time.

